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Flood Risk Assessment

ON

**Land at
Wakefield Road, Mapplewell,
Barnsley**

For

PIPESTONE LTD.

E08/4794/FR001a

October 2008

Revised July 2009

T. Haigh. BSc.,C.Eng.M.I.C.E.

INTRODUCTION

This report is commissioned to investigate and report on the Flood Risk of this site in accordance with PPS25. The report is based on information supplied by the client and from relevant authorities in both written and verbal format. Some of this information has been given in verbal format only. No liability can be accepted for information supplied by third parties which is subsequently found to be inaccurate or incorrect.

THE SITE

The site is located adjacent to Wakefield Road Mapplewell (A61) close to the junction with Bar Lane B6131. The OS Grid reference for the site is SE 34020 09644. A site location plan is attached in the Appendices.

The site is approximately rectangular in nature, with only a primary frontage to Wakefield Road on the western boundary. The site is fully developed with a large manufacturing Unit covering 50% of the site. The area around the building is laid out as hard paved access roads and storage areas. The remaining area of the site is open grass and scrubland. To the north of the site is a small residential development of three to four large detached houses. To the west of the site is existing residential development as there is to the south of the site. To the south east of the site is an abandoned railway track in a deep cutting. To the east of the site is open farmland that falls away from the site. The total site area is 5.17ha of which the developable area including the existing buildings, is approximately 4.42ha.

The site is thought to be underlain by coal measures which will be a mixture of mudstones and sandstones in varying thickness layers. It is likely that clays will be found overlying the bedrock which would probably be unsuitable for infiltration techniques. Once a site investigation report is available this could be verified.

Site levels vary from 103m AOD in the northwest corner down to 94.5m in the southeast corner and along the eastern boundary. There is a central plateau on which the existing buildings stand that has a general level around 97.2m AOD. There is a ditch marked on the site survey and an area of ponding in the north east corner of the site.

Site falls vary from virtually flat over the building footprint, to 1 in 3 where this plateau eats into the existing ground at the northern end of the site. There are similar banks to the south and east of the buildings that not are quite as steep.

The railway cutting on the south-eastern corner is 3 to 4 m below the site at this point.

There are no watercourses on or abutting the site shown on the ordnance survey plans but there is a shallow ditch adjacent to the southern boundary.

The adjacent ground to the north and north west is slightly higher than the site and the fields to the east slope away from the site. The residential developments to the west all fall away from the site and are separated from it by A61 Wakefield Road. There are no surface water sewers shown in the vicinity of the site and only small diameter combined sewers shown in Wakefield Road. These do not appear to be deep enough or have sufficient capacity to service this site. It may be necessary to provide a pumped system for foul and surface water drainage of the site.

PROPOSED DEVELOPMENT

We only have a preliminary copy of the proposed development which shows a series of detached, semidetached and terraced houses and small industrial units accessed off Wakefield Road to the west of the site. The proposals are therefore for a mixed use development.

FLOOD RISK

There are a number of potential flooding mechanisms that PPS25 now requires are evaluated for each proposed development site. Each method of flooding requires an assessment to be made on its probability relative to the site development. The normal requirement of the document is for no flooding of properties for storms up to a 1% probability or a once in a 100 years storm. The risk assessment also includes for flooding both on site and off site, and the effects of the development on the downstream catchment or the flow regime of the watercourse. PPS25 also requires that the effects of severe storms above the normal 1% probability are reviewed together with the effects of climatic change relating to the design life of the development.

PPS 25 – Development and Flood Risk 2007 requires that Flood Risk Assessments review whether or not the development of a site will not add to and should where practicable reduce the flood risk for both on site and off site properties. The future users of the development must not be placed in danger from flooding and should remain so throughout the lifetime of the proposed development. It also requires that the effects of climate change are taken into account together with the impacts of extreme events and flood defence failures. To this extent the Sequential Test outlined in PPS 25, must be applied to each development site.

Based on the published Environment Agency Flood Risk Maps part of the development site does not falls within the 1% Flood Risk area (Zone 3) and the whole of the site falls outside the 0.1% Flood Risk area (zone 2). The development site predominantly falls within Zone 1. The proposed development of residential falls within the More Vulnerable Classification in Table 02 of Annex D to PPS25. The proposed industrial development falls within the Less Vulnerable Classification in Table 02 of Annex D to PPS25. The site has previously been partially developed for this use. The sequential test is therefore considered to be passed and the development is considered appropriate in terms of flood risk.

PPS 25 requires that each flooding mechanism is addressed and levels of risk evaluated. We consider there are three main risks of flooding to the site the alternative mechanisms are not applicable to this site.

1. Inundation from floodwaters leaving watercourses or rivers entering the site. This can include the effects on culverted watercourses and where the risk of blockage can occur and from breach scenarios.
2. Rainwater falling on the site and not being able to leave the site at sufficient rate to prevent flooding on the site.
3. Overland flows from adjacent land sites due to surcharging of sewerage systems or other watercourses.
4. The impact of the developed site on the existing drainage systems and off-site surface water systems must also be assessed as part of this flood risk assessment.

Each will be discussed in turn.

1. Flood Risk from Watercourses, River & Tidal

The proposed development site appears not to fall within the 1% probability Flood Risk Maps as published by the Environment Agency and not within the 0.1% Flood Risk Area. The site is therefore adjudged to fall with zone 1. The flood risk maps indicate the extent of the flood plain extends around the River Dearne to the south west of the site indicating possible flood risks downstream. The site would fall within Zone 1 of the Environment Agency designation under PPS 25.

The risk of flooding from river or tidal water is therefore considered acceptable for residential development on this site.

2. Risk of Flooding from overland flows from adjacent land.

The site lies on a shallow ridge with areas to the east and west falling away from the site. The area to the north is slightly higher than the site but Wakefield Road effectively forms a ridge and water would tend to shed eastwards rather than enter the site. The existing residential development on provide a level of protection due to the existing surface water drainage systems that should normally be capable of catering for storms up to the 30 year return period. For storms in excess of this any surcharge from the sewers would initially flow away from the site.

This would leave only a very small catchment to that could develop flows that may pass through the site. This risk would be very low and deemed acceptable subject to the normal flood routing now required by sewers for adoption.

3. Risk of Flooding from Rainwater Falling on Site

Prior to any further design works it would be prudent to establish the current outfalls for the surface water from the site by the implementation of a drainage survey on site. This would help establish the existing discharge rates and routes for the site and allow negotiations with the Land Drainage Authorities and the Environment Agencies.

The redevelopment of the site should reduce the impermeable area and hence reduce the uncontrolled discharge from the site. At present we do not know what the current discharge rates are, nor do we know their routes. If these flows were connected into the existing combined drainage system, without any storm-water attenuation this could increase flows down stream and increase possible flood risks to downstream properties. It is therefore necessary to eliminate this risk by provision of attenuation systems that will reduce storm water run off to current discharges. These can only be designed once the drainage system on site is evaluated. It is current policy with the Environment Agency and local Land Drainage Authorities to reduce surface water discharges by 30% on redevelopment sites and provide surface water storage systems that cater for storms up to the 100 year storm plus an allowance of 20% to cater for Climate change.

The risk of flooding from water falling on site and not being able to leave in sufficient rates can be managed by the use of above ground or underground storage systems and providing a flow control device to restrict discharges to existing levels.

The site currently has a substantial amount of impermeable areas i.e. roof and hard-paved areas (14125sqm). This would equate to a discharge of approx 160l/sec for 1 in 1 year storm or 275 l/sec for a 100 year storm. A full on site drainage investigation is required to determine which areas are positively drained from the site in order to determine an acceptable discharge rate from the development site. Failing this the discharge rate would have to be limited to agricultural rates of discharge.

Discussions with Yorkshire Water, Barnsley MDC Land Drainage Department and the Environment Agency will be necessary to agree discharge rates. If these are limited to 70% of existing this could be as high as 110 l/sec. if a positive discharge cannot be proved then this discharge may be reduced to agricultural rates of 5lit/s/ha. This would give a discharge of 22lit/sec maximum.

Based on a proposed development plan passed to us the redevelopment with a mixed development of residential and light industrial units. It would be prudent to split the attenuation systems with separate systems catering for the residential and the industrial areas. The allowable discharges would be split proportionately to the percentage of site developed for each purpose. For the residential development the impermeable area of this part of the site would be approximate to 12950 sq. m. of impermeable roofs and paved areas. For the industrial development the impermeable

area of this part of the site would be approximate to 12300 sq.m. of roofs and paved areas. This could be reduced somewhat if permeable surfaces are feasible but this will depend on the ground conditions pertaining on site.

The developments would increase run off from the site by 72% if no attenuation of storm flows takes place. The development of the site without storm-water attenuation would increase the risk of flooding downstream of the site. There are known problems downstream any increase in discharges to it would accentuate these problems. It is therefore important that on site attenuation is implemented on this site. It would therefore be prudent to restrict flows from the site to agreed discharge rates and provide storage to cater for storms up to the 1% return probability and add an allowance for climatic change related to the design life of the propose development. This would currently suggest a 20% increase in flood water storage volume requirements.

For the residential area approximate storage volume required would be 738cu.m to cater for a 100 year storm with allowances for climate change for a discharge of 11 l/sec. and 338 cu.m to cater for a 100 year storm with allowance for climate change for a discharge of 53l/sec ie 70% of the existing run off from paved or roofed areas. For the industrial area approximate storage volume required would be 686cu.m to cater for a 100 year storm with climate change with a discharge of 11 l/sec. and 332 cu.m. to cater for a 100 year storm with climate change for a discharge of 53l/sec i.e. 70% of the existing run off. This storage can be provided in a number of forms, an open swale or detention basin being the most sustainable option but this may be difficult to provide on such a steep sloping site without providing a pumped storage system or proving a natural outlet from the lower eastern area of the site.

The site investigation suggests that the site is covered with Middle Coal Measures with clays overlying alternating layers of mudstone and sandstones. It reports that infiltration methods are unlikely to usable on this site. Conversely further site investigation may prove the underlying sandstones may be at shallow depth and the use of soak-away's may be acceptable. The utilisation of these will need on site testing before details designs could be submitted. This method of storm-water disposal would also reduce the flood risks to downstream properties due to the site development.

We would suggest that detailed designs are submitted at detail planning stage once layouts and extents of development are agreed.

CONCLUSIONS

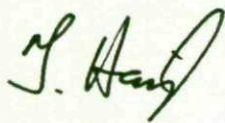
In our opinion the proposed development site is not at risk of flooding from river or tidal water up to a 0.1% return period. The site falls with Zone 1 and therefore suitable for the proposed development.

The risk of flooding from overland flows is considered to be very low and acceptable for residential development. This should be coupled with managed flood routes and lifting floor levels to 300mm above road centre line levels where possible to ensure no flooding of buildings.

The development of the site without any attenuation of storm-water discharges could create further problems on the downstream watercourse, so attenuation of storm-water flows to agreed or agricultural rates will be required.

The use of infiltration systems to serve the development is not thought to be possible. Further site investigations could be carried out to assess their suitability for this site.

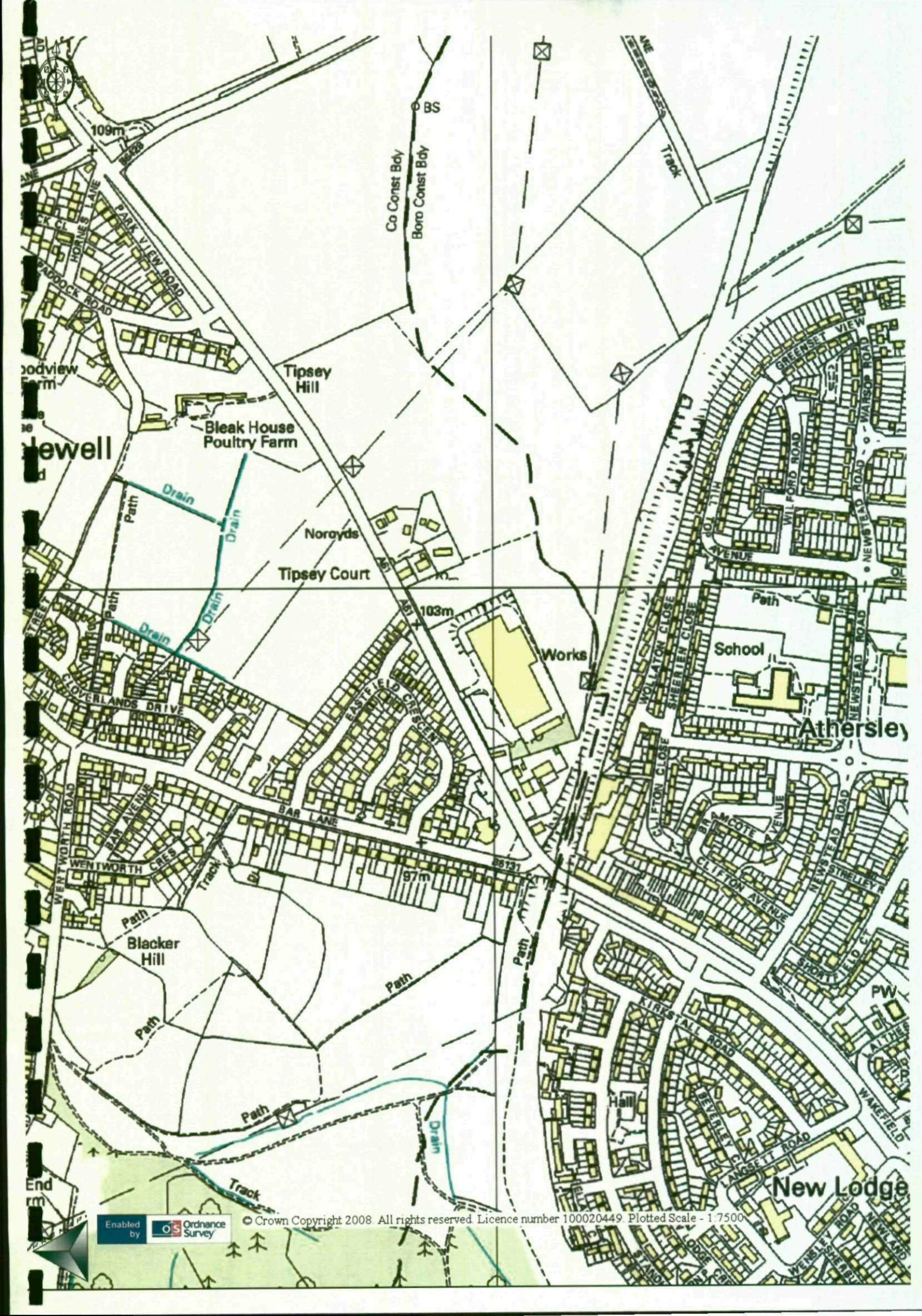
If the measures outlined above are implemented we would consider that the requirements of PPS25 can be satisfied.



T.Haigh B.Sc. C.Eng M.I.C.E.

APPENDIX A

LOCATION PLAN



APPENDIX B

AERIAL VIEW



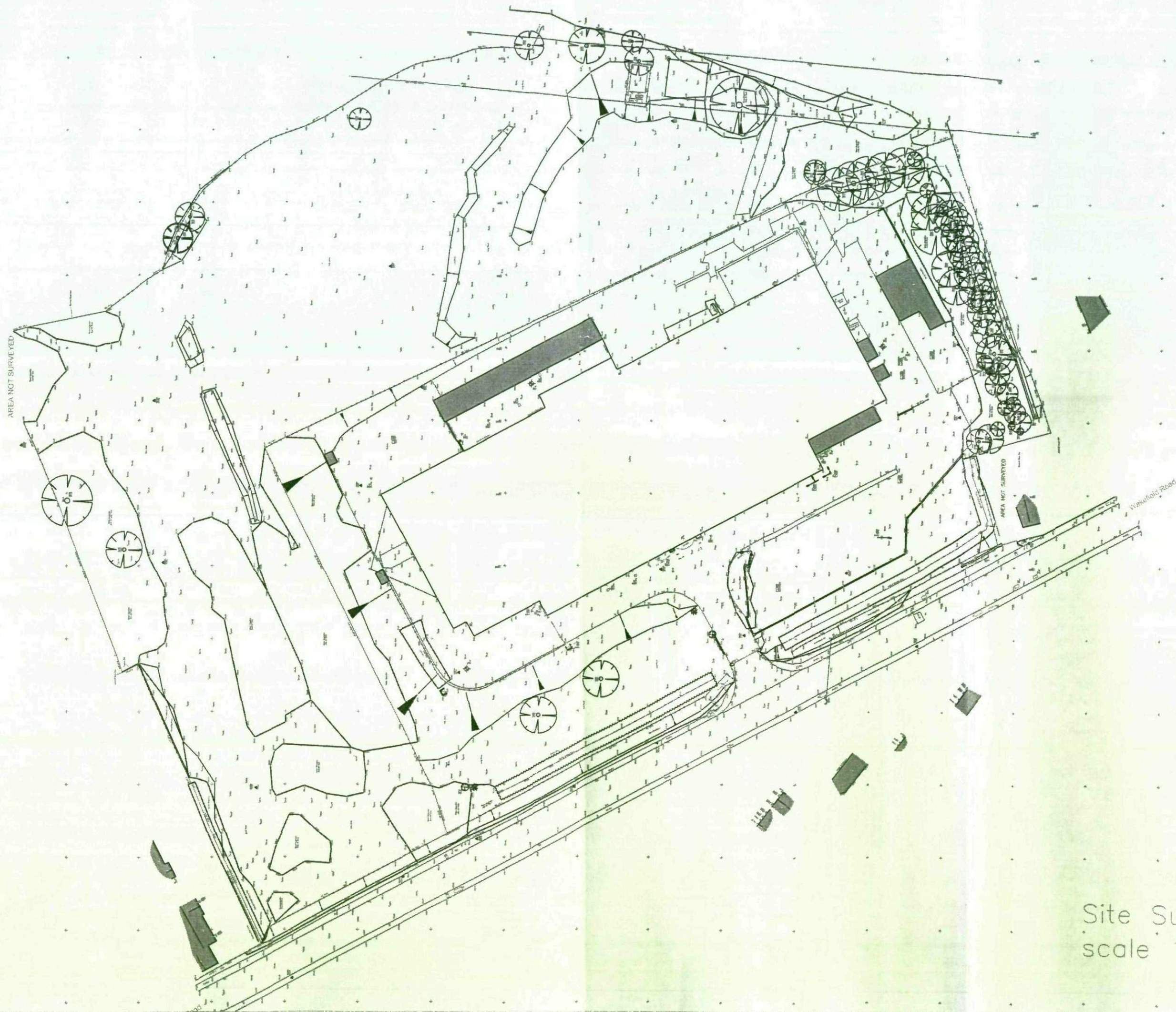
Image © 2008 The GeoInformation Group

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223 m

lat: 1.85° elev: -1.41° Feb: all

APPENDIX C
SITE SURVEY



Site Survey
scale 1/1000

APPENDIX D

DEVELOPMENT PLAN

PIPESTONE LTD

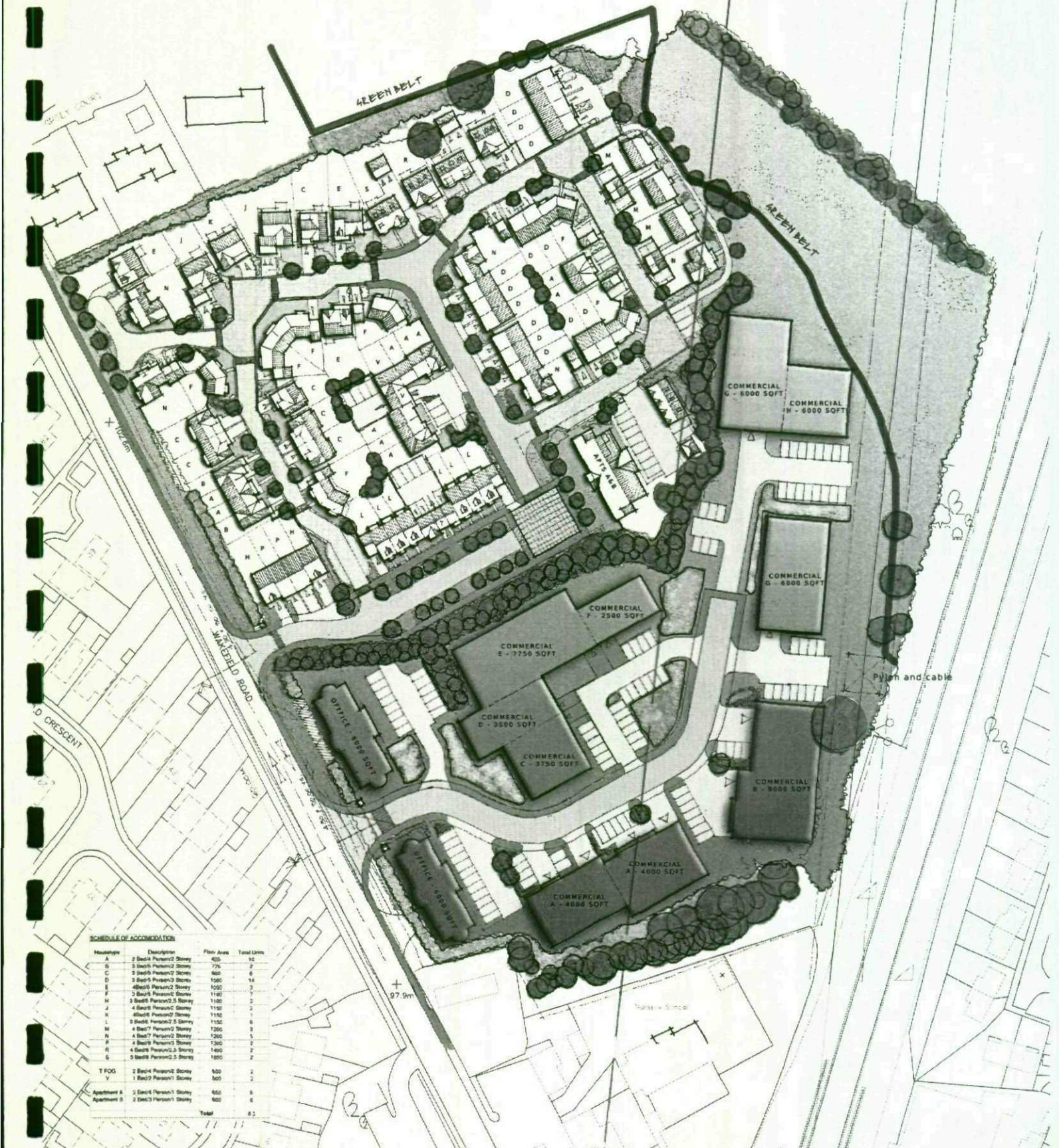
COMMERCIAL UNITS

OFFICE 2no. 6000 sqft	12000
A 2no. 6000 sqft	8000
B 1no. 9000 sqft	9000
C 1no. 3750 sqft	3750
D 1no. 2500 sqft	2500
E 1no. 7750 sqft	7750
F 1no. 2500 sqft	2500
G 2no. 6000 sqft	12000
H 1no. 6000 sqft	6000

Total : 12 units

Total sqft : 64500

60 metre standoff from
line of pylon cable

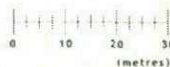


SCHEDULE OF ACCOMMODATION

House/Type	Description	Floor Area	Total Units
A	2 Bed/4 Person/2 Storey	600	10
B	3 Bed/5 Person/2 Storey	775	2
C	3 Bed/5 Person/2 Storey	900	6
D	3 Bed/5 Person/2 Storey	1200	14
E	4 Bed/6 Person/2 Storey	1022	2
F	3 Bed/5 Person/2 Storey	1100	7
H	3 Bed/5 Person/2 Storey	1100	2
J	4 Bed/6 Person/2 Storey	1100	2
K	4 Bed/6 Person/2 Storey	1100	2
L	3 Bed/5 Person/2 Storey	1100	6
M	4 Bed/6 Person/2 Storey	1200	2
N	4 Bed/6 Person/2 Storey	1200	5
P	4 Bed/6 Person/2 Storey	1200	2
R	4 Bed/6 Person/2 Storey	1400	2
S	5 Bed/8 Person/2.5 Storey	1800	2
TPOG	2 Bed/4 Person/2 Storey	600	2
V	1 Bed/2 Person/1 Storey	500	2
Apartment A	2 Bed/4 Person/1 Storey	600	6
Apartment B	2 Bed/3 Person/1 Storey	600	6
Total			62

D08 4145 SK01 - Rev C

PROPOSED DEVELOPMENT,
MAPPLEWELL, Nr BARNSELY



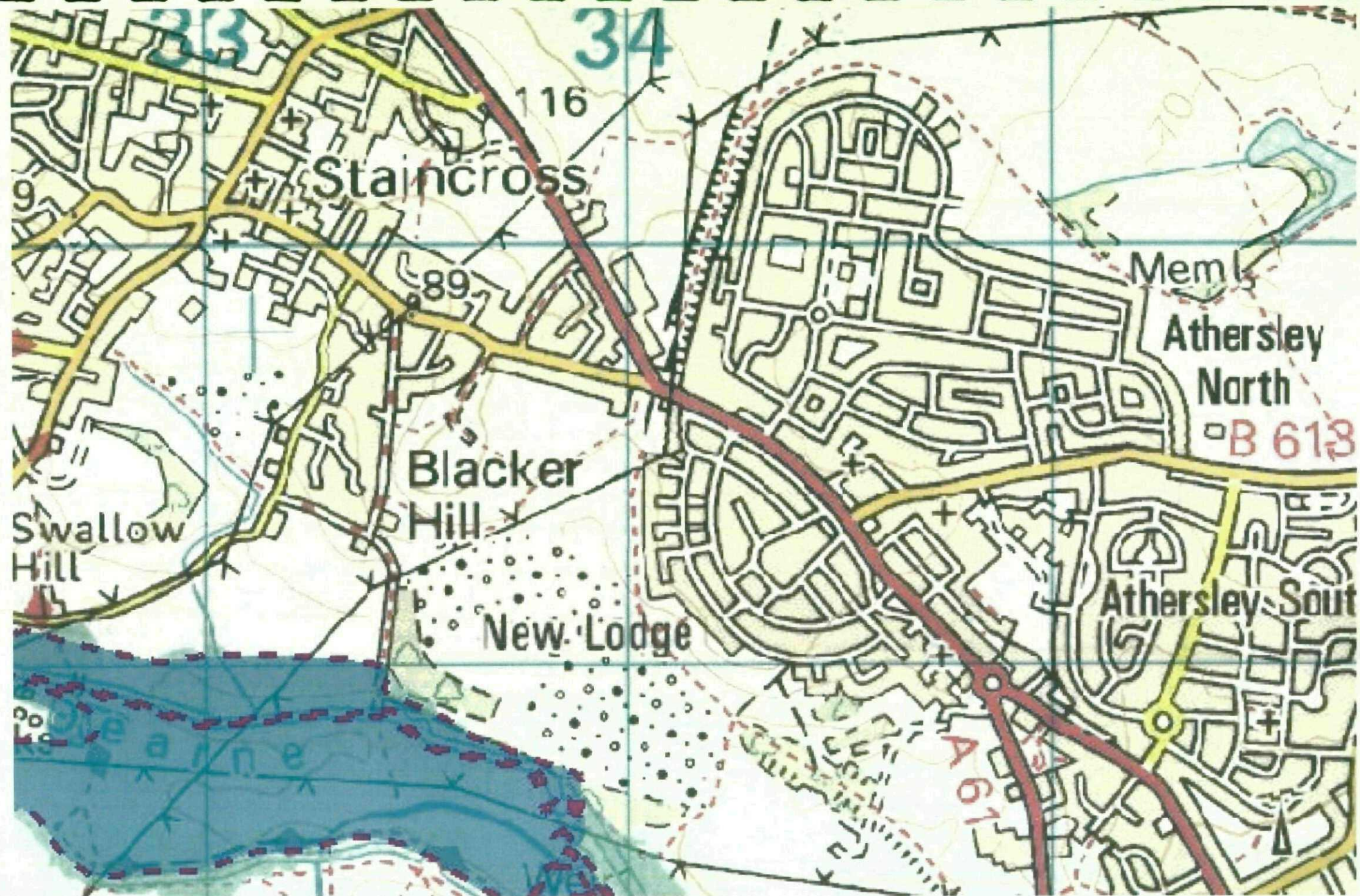
■ architectural design
■ town planning
■ landscape architecture

JRP

John R Paley Associates

APPENDIX E

ENVIRONMENT AGENCY FLOOD PLAIN MAP



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Staincross

Blacker Hill

New Lodge

Athersley North

B 613

Athersley South

Swallow Hill

A 613

APPENDIX F

STORMWATER STORAGE CALCULATIONS

Client Pipestone Ltd

Site Wakefield Road Mapplewell Barnsley
Industrial AreaDesign storm 100 M5-60 19 mm
r 0.35

Site area sq m. 42000

Imp Area sq m. 12310

T of Conc min 4 Time to Flow

Allow Discharge 47 Lit / sec Imp Ratio 0.29

Storm Duration	Intensity	Depth	Vol In	Vol Out	Storage	Q	t
Mins	mm/hr	mm	cu.m	cu.m	cu.m		
10	81.8	13.63	167.83	37.59	130.24	279.93	0.7
20	59.8	19.93	245.38	65.09	180.29	204.65	0.9
30	47.6	23.80	292.98	92.63	200.35	162.90	1.2
50	34.4	28.67	352.89	147.78	205.11	117.72	1.6
60	30.3	30.30	372.99	175.37	197.63	103.69	1.8
120	18.7	37.40	460.39	341.40	119.00	63.99	2.9
180	14.1	42.30	520.71	507.89	12.82	48.25	3.9
240	11.5	46.00	566.26	674.61	-108.35	39.36	4.8
300	9.8	49.00	603.19	841.47	-238.28	33.54	5.6
360	8.7	52.20	642.58	1008.67	-366.09	29.77	6.3
420	7.9	55.30	680.74	1176.07	-495.33	27.04	7.0
480	7.5	60.00	738.60	1344.22	-605.62	25.67	7.3
540	6.9	62.10	764.45	1511.63	-747.18	23.61	8.0
600	6.38	63.80	785.38	1679.00	-893.62	21.83	8.6

Storage 205.11

Length of 1800	80.60				
Length of 1500	116.08	Culvert	2.4*1.5m	56.98	Pond 900mm deep
Length of 1200	181.35	culvert	3.6*1.8m	31.65	
Length of 1050	236.85		333.83		
Length of 900	322.50		454.56		
Length of 750	464.05		654.07		

100 year storm

Intensity	Depth	Vol In	Vol Out	Storage
mm/hr	mm	cu.m	cu.m	cu.m
101.27	16.88	207.77	37.59	170.18
74.03	24.68	303.78	65.09	238.69
58.93	29.46	362.71	92.63	270.08
42.59	35.49	436.87	147.78	289.10
37.51	37.51	461.77	175.37	286.40
23.15	46.30	569.97	341.40	228.57
17.46	52.37	644.64	507.89	136.75
14.24	56.95	701.03	674.61	26.42
12.13	60.66	746.75	841.47	-94.72
10.77	64.62	795.52	1008.67	-213.16
9.78	68.46	842.76	1176.07	-333.31
9.29	74.28	914.39	1344.22	-429.84
8.54	76.88	946.39	1511.63	-565.24
7.90	78.98	972.30	1679.00	-706.70

Storage 289.10

227.9 30 year
321.219 100 year
369.055 100 year plus climatic

100year plus climate

Intensity	Depth	Vol In	Vol Out	Storage
mm/hr	mm	cu.m	cu.m	cu.m
111.25	18.54	228.24	37.59	190.66
81.33	27.11	333.72	65.09	268.63
64.74	32.37	398.45	92.63	305.82
46.78	38.99	479.93	147.78	332.15
41.21	41.21	507.27	175.37	331.90
25.43	50.86	626.14	341.40	284.74
19.18	57.53	708.17	507.89	200.28
15.64	62.56	770.11	674.61	95.50
13.33	66.64	820.34	841.47	-21.13
11.83	70.99	873.91	1008.67	-134.76
10.74	75.21	925.81	1176.07	-250.26
10.20	81.60	1004.50	1344.22	-339.73
9.38	84.46	1039.65	1511.63	-471.97
8.68	86.77	1068.11	1679.00	-610.88

Storage 332.15

Length of 900 522.25 454.56